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| Form PTO-1390 (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER 702-010717 |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | U.S. APPLICATION NO. <small>if known, see 37 CFR 1.5</small> 09/831001 |
| INTERNATIONAL APPLICATION NO PCT/NL99/00677 ✓ | INTERNATIONAL FILING DATE 04.11.99 (November 04, 1999) | PRIORITY DATE CLAIMED 04.11.98 (November 04, 1998) |
| TITLE OF INVENTION DEVICE FOR TREATING A GAS/LIQUID MIXTURE ✓ | | |
| APPLICANT(S) FOR DO/EO/US Cindy Thérèse Cornelia CUYPERS and David Ian STANBRIDGE ✓ | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information | | |
| <ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371 <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(h) and PCT Articles 22 and 39(1) <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau) <input checked="" type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)) <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau) <input type="checkbox"/> have been transmitted by the International Bureau <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired <input checked="" type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)) <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)) | | |
| Items 11. to 16. below concern document(s) or information included: | | |
| <ol style="list-style-type: none"> <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98 <input type="checkbox"/> An assignment document for recording A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment <input type="checkbox"/> A substitute specification <input type="checkbox"/> A change of power of attorney and/or address letter <input checked="" type="checkbox"/> Other items or information <ol style="list-style-type: none"> a. WO 00/25931-Front Page with Abstract, Specification, Claims, Drawings and Search Report (15 pp.) b. International Preliminary Examination Report and Annex (8 pp.) | | |

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| U.S. APPLICATION NO. 11/091,831 | | INTERNATIONAL APPLICATION NO PCT/NL99/00677 | ATTORNEY'S DOCKET NUMBER 702-010717 |
| 17. <input checked="" type="checkbox"/> The following fees are submitted | | CALCULATIONS PTO USE ONLY | |
| BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5): | | | |
| Search Report has been prepared by the EPO or JPO | | \$860.00 | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) | | \$690.00 | |
| No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search paid to USPTO (37 CFR 1.445(a)(2)) | | \$710.00 | |
| Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO | | \$1,000.00 | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) | | \$100.00 | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | \$ 860.00 | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | \$ 130.00 | |
| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE |
| Total claims | 12 - 20 | 0 | X \$18.00 |
| Independent claims | 3 - 3 = | 0 | X \$80.00 |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | + \$270.00 | \$ 0.00 |
| TOTAL OF ABOVE CALCULATIONS = | | \$ 990.00 | |
| Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) | | \$ 0.00 | |
| SUBTOTAL = | | \$ 990.00 | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)) | | \$ 0.00 | |
| TOTAL NATIONAL FEE = | | \$ 990.00 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). | | \$40.00 per property | + \$ 0.00 |
| TOTAL FEES ENCLOSED = | | \$ 990.00 | |
| | | Amount to be refunded | \$ |
| | | charged | \$ |
| <p>a. <input checked="" type="checkbox"/> A check in the amount of <u>\$ 990.00</u> to cover the above fees is enclosed</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No <u> </u> in the amount of <u>\$ </u> to cover the above fees. A duplicate copy of this sheet is enclosed</p> <p>c. <input checked="" type="checkbox"/> The Assistant Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No <u>23-0650</u>. A duplicate copy of this sheet is enclosed</p> | | | |
| <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> | | | |
| SEND ALL CORRESPONDENCE TO Richard L. Byrne 700 Koppers Building 436 Seventh Avenue Pittsburgh, Pennsylvania 15219-1818 Telephone: (412) 471-8815 Facsimile: (412) 471-4094 | |  SIGNATURE <u>Richard L. Byrne</u> NAME <u> </u> 28,498 REGISTRATION NUMBER | |

PATENT APPLICATION/PCT
Attorney's Docket No. 702-010717

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :

Cindy Thérèse Cornelia CUYPERS :
David Ian STANBRIDGE :

DEVICE FOR TREATING A
GAS/LIQUID MIXTUREInternational Application :
No. PCT/NL99/00677 :

International Filing Date :
04 November 1999 :

Priority Date Claimed :
04 November 1998 :

Serial No. Not Yet Assigned :

Filed Concurrently Herewith :

Pittsburgh, Pennsylvania
May 3, 2001PRELIMINARY AMENDMENTAssistant Commissioner for Patents
Washington DC 20231

Sir:

Prior to initial examination, please amend the above-identified patent application
as follows:IN THE SPECIFICATION:

Please insert section headings.

On page 1, after the title, please insert the following section heading:

BACKGROUND OF THE INVENTION

On page 1, after the fourth complete paragraph, please insert the following section heading:

SUMMARY OF THE INVENTION

On page 3, before the first complete paragraph, please insert the following section heading:

BRIEF DESCRIPTION OF THE DRAWINGS

On page 3, after the first complete paragraph, please insert the following section heading:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

IN THE CLAIMS:

Please cancel original claims 1-11 and cancel amended claims 1-12 and rewrite them as new claims 13-24 as follows:

13. A device for treating a gas/liquid mixture, comprising:
 - a) a tube having an inlet opening for the mixture and an outlet for the mixture located downstream;
 - b) rotating means arranged in the tube for setting the mixture into rotating movement;
 - c) one or more outlet openings arranged downstream relative to the rotating means for allowing a part of the mixture to flow laterally out of the tube;
 - d) a return conduit arranged centrally in axial direction through the rotating means for reintroducing the flow which has exited via the outlet openings; and
 - e) divergence means arranged close to the outer end of the return conduit for allowing the reintroduced flow to diverge laterally outward.

14. The device as claimed in claim 13, wherein the divergence means comprise slots recessed into an end part of the return conduit.

15. The device as claimed in claim 13, wherein the divergence means comprise a substantially conical element close to the outer end of the return conduit.

16. The device as claimed in claim 13, wherein the outlet openings are formed by a number of longitudinal slots in the side wall of the tube.

17. The device as claimed in claim 13, wherein the rotating means comprise a swirl element, of which the outflow angle for the mixture amounts to 15°- 85°.

18. The device as claimed in claim 17, wherein the outflow angle amounts to about 45°, about 60° or about 70°.

19. The device as claimed in claim 13, wherein the average diameter of 50% of droplets in the mixture amounts to 4 μm or less.

20. An installation for separating water from gas, comprising:

- a) a vessel provided with a connecting stub for supply of the mixture;
- b) a drain conduit for draining liquid collected in the bottom of the vessel;

and

- c) one or more boxes in which one or more devices as claimed in claim 13 are arranged.

21. The installation as claimed in claim 20, wherein at least one liquid conduit extends between the box and the space in the bottom of the vessel where the liquid is collected.

22. A device for treating a gas/liquid mixture according to claim 13, comprising:

- a) a tube having an inlet opening for the mixture;
- b) rotating means arranged in the tube for setting the mixture into rotating

movement; and

c) a substantially conically tapering outlet for the mixture located downstream, wherein one or more slots are arranged to allow a part of the mixture to flow laterally out of the outlet.

23. The device as claimed in claim 22, wherein the conicity of the tapering outlet amounts to 1° - 30° .

24. The device as claimed in claim 22, further including an additional tube part which protrudes at least partially upstream in the outlet.

IN THE ABSTRACT:

After the claims, please insert a page containing the Abstract Of The
Disclosure, which is attached hereto as a separately typed page.

REMARKS

Amendments have been made to the specification in order to conform the specification to standard United States Patent practice.

Original claims 1-11 and Amended claims 1-12 have been canceled and rewritten as new claims 13-24.

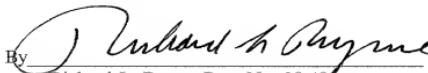
An Abstract Of The Disclosure has been added as a separately typed page to be inserted after the claims.

Examination and allowance of claims 13-24 are respectfully requested.

Respectfully submitted,

WEBB ZIESENHEIM LOGSDON
ORKIN & HANSON, P.C.

By


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SEARCHED
INDEXED
SERIALIZED
FILED

DEVICE FOR TREATING A GAS/LIQUID MIXTURE

So-called cyclones are used on a large scale to separate gas/liquid mixtures, for instance to dry natural gas. On extraction the natural gas can be mixed with salt water, which can cause much corrosion in the pipelines

5 through which the gas must flow.

In a so-called axial cyclone the entering mixture is set into a rotating movement, whereby a heavy fraction (in the order of magnitude of 2-25% of the total flow) in which a relatively large amount of liquid is 10 present, is flung against the outer wall of the cyclone. This fraction can be discharged by arranging openings in the outer wall. It is also already known to reintroduce a part of the discharged fraction into the liquid flow in order to further separate this fraction as well into 15 liquid and gas phase.

In the known cyclones the outlet opening for the returned flow is usually arranged in the centre of the cyclone. As the mixture has a substantially axial speed component in the centre of the cyclone, creep may 20 occur along the outlet opening whereby liquid droplets from the inlet flow enter the outlet flow. When capacity is increased, i.e. when the pressure and/or the quantity of the mixture is increased, such creep will become worse.

25 In view of the above, the capacity of such a cyclone forms a limitation, whereby installations for the desired gas/liquid separation would have to increase in size, which is undesirable.

The present invention provides a device for 30 treating a gas/liquid mixture, comprising:

- an inlet opening for the mixture and an outlet for the mixture located downstream;

- rotating means arranged in the tube for setting the mixture into rotating movement;
- one or more outlet openings arranged downstream relative to the rotating means for allowing a part of the mixture to flow laterally out of the tube;
- a return conduit arranged in axial direction through the rotating means for reintroducing into the tube the flow which has exited via the outlet openings; and

10 - divergence means arranged close to the outlet opening of the return conduit for allowing the reintroduced flow to diverge laterally.

The rotating means preferably comprise a so-called swirl element with an outflow angle, for the mixture of more than 30°, for instance roughly 45°, 60° or 70°, whereby the tangential speed component of the mixture, and therefore the swirl number, and the separation efficiency are increased.

20 The present invention further provides an installation, wherein one or more devices according to the present invention are applied.

The present invention further provides a device for treating a gas/liquid mixture, comprising:

- an inlet opening for the mixture;
- rotating means arranged in the tube for setting the mixture into rotating movement; and
- a substantially conically tapering outlet for the mixture located downstream, wherein one or more slots are arranged to allow a part of the mixture to flow laterally out of the outlet.

30 Due to the conically tapering outlet pipe the pressure on the wall remains substantially at a constant value, whereby the separation of liquid via the slots proceeds better since pressure drop, whereby liquid could re-enter the outlet pipe, is avoided.

An additional tube is preferably arranged upstream in the outlet pipe, so that the slots can be as long as the outlet pipe permits.

Further advantages, features and details of the present invention will be elucidated on the basis of the following description with reference to the annexed drawings, in which:

5 fig. 1 shows a partly schematic view of an installation for separating a gas/liquid mixture, wherein a device according to the present invention is applied;

fig. 2 shows a partly cut-away view in perspective of detail II of fig. 1; and

10 fig. 3 shows a partly cut-away view in perspective of a further preferred embodiment of a device according to the present invention.

A vessel 1 (fig. 1) is provided with a connecting stub 2 for intake of gas/liquid mixtures, such

15 as natural gas mixed with (salt sea)water. At the bottom of vessel 1 is collected the liquid F which can be drained via a pipe 3. In addition to a number of separating means (not shown), a number of boxes 4 are arranged in the upper part of vessel 1, while thereabove

20 a connecting stub 5 is arranged on the vessel for discharging gas which has been dried at least partially or to a considerable degree. Boxes 4 are each provided individually or collectively with a conduit 6 which is in communication with the liquid F in the bottom of the

25 vessel for draining liquid from each of the boxes.

Although in the present embodiment the boxes 4 are shown in a vertical arrangement, they can also be in a lying arrangement in another preferred embodiment which is not further shown.

30 In an embodiment of a box 4, fig. 2, are situated eight cyclones 10, one of which is shown in fig. 2, which each comprise a cylindrical wall 11 which forms on the underside an inlet for the gas/liquid mixture, and an outlet opening 12 on the upper side thereof. Roughly 35 centrally in the space enclosed by the cylindrical wall is placed a so-called swirl element 13 which is provided with blades 14 for setting the mixture into rotating movement. A part of the mixture is flung outward by this

rotating movement, as indicated with arrows A, and transported via an interspace 15 to a recycle conduit 16. Recycle conduit 16 extends through swirl element 13 and is closed at the top with a substantially conical cap 17.

5 Under conical element 17 slots 19 are recessed into an end part 18 of conduit 16 to allow the mixture recycled via conduits 16 (about 15% of the quantity of the original mixture) to exit in divergent manner. Further connected to space 15 is a conduit 21 for draining 10 liquid, which conduit debouches onto a ring line 22 into which drain conduits of other cyclones debouch on one side and the downcomer 6 to the space in the bottom of the vessel for collecting liquid F is connected on the other.

15 Measurements have been taken on the above described cyclone under atmospheric pressure with a PITOT tube adapted for this purpose. The radial pressure profile in the tube is measured herewith as well as the so-called swirl number. The swirl number, i.e. the ratio 20 of the tangential angular momentum flux relative to the axial angular momentum flux of the flow in the cyclone largely determines the separation characteristic or the efficiency of the cyclone. The value of the pressure prevailing around the cyclone generally lies between the 25 pressure on the wall and the pressure at the location where the recycle conduit debouches into the cyclone. A steep pressure profile between the centre and the wall of the cyclone tube ensures that the recycle flow is sufficiently powerful, and furthermore that the static 30 pressure around the cyclone is as high as possible.

It has been found from numerical flow simulations and the above mentioned experimental research that the above stated objectives are achieved not only by using the above described diverging flow but also by 35 making the outflow angle of the mixture along the swirl element relatively large, for instance about 45°, 60° or 70°, preferably in any case greater than 30°, whereby the tangential speed component (and therefore the swirl

number and the separation efficiency) is increased. In order to sustain a laminar flow along such a swirl element with large outflow angle, this latter is designed using numerical flow simulation methods.

5 Due to the realized lateral outflow of the recycle flow, liquid creep to the middle of the swirl element is (all but) wholly prevented, as straight moving flow is no longer present in the centre of the flow. The droplets coming from the recycle flow are entrained in
10 the swirl flow and separated via the slots. It also becomes possible hereby to increase the maximum capacity of the cyclone. From the measurements under atmospheric conditions the conclusion seems justified that capacity can also be increased at higher pressure and with a
15 factor in the order of magnitude of two.

At higher capacity small droplets are separated better by the associated higher tangential speeds. This is expressed as D_{50} , i.e. the average diameter of 50% of the droplets, and amounts to 4 μm in the above described
20 preferred embodiment of the present invention.

In the device according to the present invention practically the whole gas/liquid flow has a tangential speed component, whereby the swirl number is higher as well as the separation efficiency.

25 Because the average pressure in the chamber outside the cyclone becomes higher, liquid in the downcomer is prevented from being able to move upward. This so-called Static Head decreases with for instance 3-12 mBar (under atmospheric conditions), whereby the
30 cyclone according to the present invention is also more useful than existing cyclones in a horizontal arrangement.

Arranged above a swirl element 10 in a device
30 (fig. 3) is a conically tapering outlet pipe 31 which
35 is provided with outflow slots 32. Due to the conicity of for instance 1°-30° the pressure at the edge of the wall remains at a constant value and pressure drop in the outlet pipe is avoided. On the top part of conical pipe

31 is arranged a concentric pipe 33 which protrudes upstream to some extent into pipe 31 and is fixed on the other side to an upper wall 34. This additional pipe part 33 forms a barrier for the liquid at the end of the 5 outlet pipe and therefore minimizes the quantity of liquid in the outlet flow, as indicated schematically with arrows P.

Outflow slots 32 can further extend over practically the whole length of conical pipe 31, beyond the bottom edge of concentric pipe part 33.

The present invention is not limited to the above described preferred embodiment; the rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

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Appl.No. PCT/NL99/00677 1
Encl.to letter dated 02.10.2000

04.10.2000

(65)

CLAIMS

1. Device for treating a gas/liquid mixture,
comprising:

- an inlet opening for the mixture;
- an outlet for the mixture located downstream;

5 - rotating means arranged in the tube for
setting the mixture into rotating movement;

- one or more outlet openings arranged
downstream relative to the rotating means for allowing a
part of the mixture to flow laterally out of the tube;
- a return conduit arranged centrally in axial
direction through the rotating means for reintroducing
the flow which has exited via the outlet openings;

characterised by

- divergence means arranged close to the outer
15 end of the return conduit for allowing the reintroduced
flow to diverge laterally outward.

2. Device as claimed in claim 1, wherein the
divergence means comprise slots (19) recessed into an end
part (18) of the return conduit (16).

20 3. Device as claimed in claim 1 or 2, wherein
the divergence means comprise a substantially conical
element (17) close to the outer end of the return
conduit.

25 4. Device as claimed in any of claims 1-3,
wherein the outlet openings are formed by a number of
longitudinal slots in the side wall of the tube.

5. Device as claimed in any of claims 1-4,
wherein the rotating means comprise a swirl element, of
which the outflow angle for the mixture amounts to 15°-
30 85°.

6. Device as claimed in claim 5, wherein the
outflow angle amounts to about 45°, 60° or about 70°.

7. Device as claimed in any of the claims 1-6,
wherein D_{50} amounts to 4 μm or less.

AMENDED SHEET

Appl.No. PCT/NL99/00677
Encl.to letter dated 02.10.2000

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8. Installation for separating water from gas,
comprising:

- a vessel provided with a connecting stub for
supply of the mixture;

5 - a drain conduit for draining liquid collected
in the bottom of the vessel; and

- one or more boxes in which one or more
devices as claimed in one or more of the claims 1-6 are
arranged.

10 9. Installation as claimed in claim 8, wherein
at least one liquid conduit extends between the box and
the space in the bottom of the vessel where the liquid is
collected.

10. Device for treating a gas/liquid mixture

15 according to any of the claims 1-7, comprising:

- an inlet opening for the mixture;

- rotating means arranged in the tube for

setting the mixture into rotating movement; and

- a substantially conically tapering outlet for

20 the mixture located downstream, wherein one or more slots
are arranged to allow a part of the mixture to flow
laterally out of the outlet.

11. Device as claimed in claim 10, wherein the
conicity amounts to 1°-30°.

25 12. Device as claimed in claim 10 or 11,
provided with an additional tube part which protrudes at
least partially upstream in the outlet.

DEVICE FOR TREATING A GAS/LIQUID MIXTURE

ABSTRACT OF THE DISCLOSURE

The present invention relates to a device for treating a gas/liquid mixture, comprising: an inlet opening for the mixture; an outlet for the mixture located downstream; rotating means arranged in the tube for setting the mixture into rotating movement; one or more outlet openings arranged downstream relative to the rotating means for allowing a part of the mixture to flow laterally out of the tube; a return conduit arranged in axial direction through the rotating means for reintroducing into the tube the flow which has exited via the outlet openings; and divergence means arranged close to the outlet opening of the return conduit for allowing the reintroduced flow to diverge laterally.

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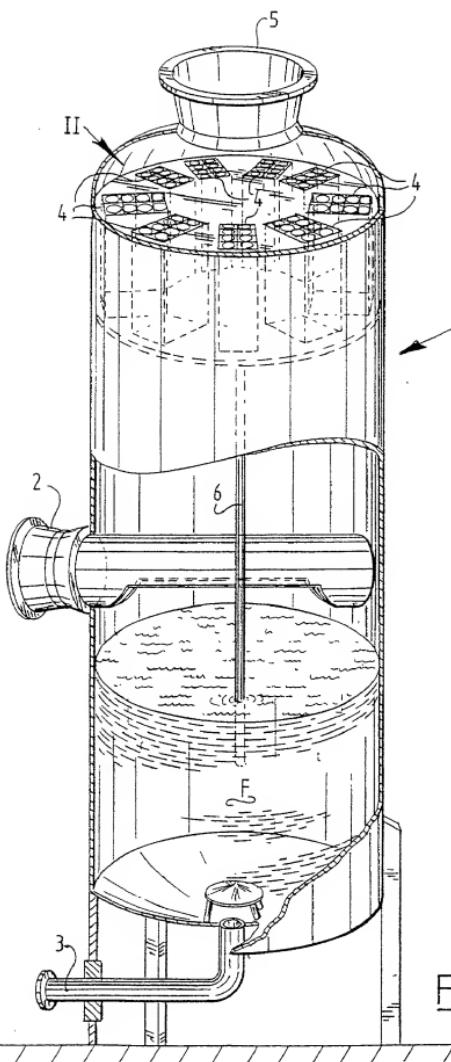
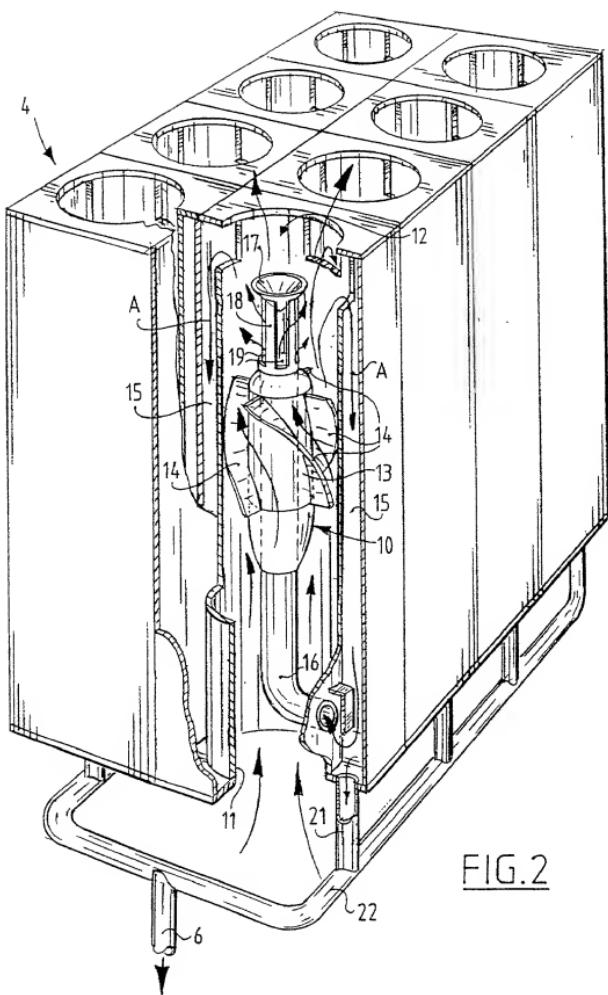


FIG. 1



3/3

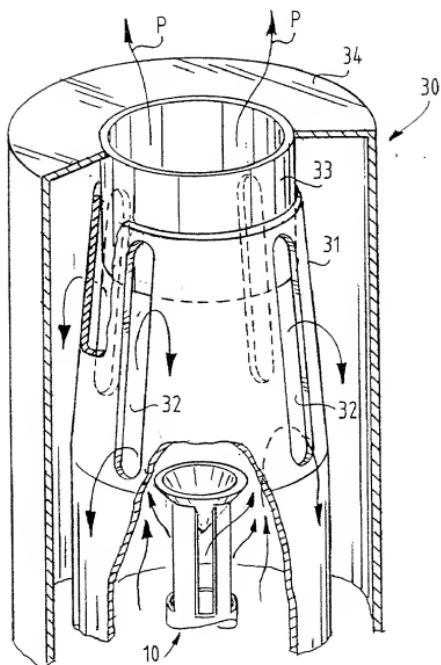


FIG.3

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, Post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Device For Treating a Gas/Liquid Mixture ✓
the specification of which ✓

(check one)

is attached hereto.

was filed on May 3, 2001. - 83

Application Serial No. 09/831,001

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

1010478-1 The Netherlands 04/11/1998
(No.) (Country) (Day/Month/Year Filed)

Yes No

(Number) (Country) (Day/Month/Year Filed)

Yes No

Number _____ Date _____ Page _____

□ □

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

Page 2 of 2

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|--|-----------------------------|--------------------------------|
| PCT/NL99/00677 (Application Serial No.) | 04/11/1999 (Filing Date) | Abandoned (Status) |
| (designating, inter alia, the United States) | | (patented, pending, abandoned) |

| | | |
|--------------------------|---------------|--------------------------------|
| (Application Serial No.) | (Filing Date) | (Status) |
| | | (patented, pending, abandoned) |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

| | | | | | |
|-------------------------|--------|-------------------|--------|-----------------------|--------|
| William H. Logsdon | 22,132 | Paul M. Reznick | 33,059 | Kent E. Baldauf, Jr. | 36,082 |
| Russell D. Orkin | 25,363 | John W. McIlvaine | 34,219 | Christian E. Schuster | 43,988 |
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| Richard L. Byrne | 28,498 | Lester N. Fortney | 38,141 | Nathan J. Prepelka | 43,016 |
| Kent E. Baldauf | 25,826 | Randall A. Noton | 36,882 | Kirk M. Miles | 37,891 |
| Barbara E. Johnson | 31,198 | James G. Porcelli | 33,757 | Jessica M. Sosenko | 47,107 |
| | | | | Gary F. Matz | 45,504 |

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| | |
|--|------------|
| Full name of sole or first inventor <u>CUYPERS, Cindy Therese Cornelis</u> | Date |
| Inventor's signature | |
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| Citizenship <u>The Netherlands</u> | |
| Post Office Address <u>Dakarhof 47, NL-2622 CP Delft, the Netherlands</u> | |
| Full name of second joint inventor, if any <u>STANBRIDGE, David Ian</u> | |
| Second inventor's signature | Date |
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| Citizenship <u>The Netherlands</u> | |
| Post Office Address <u>Rembrandtlaan 28, NL-6814 JM Arnhem, the Netherlands</u> | |

(Supply similar information and signature for third and subsequent joint inventors.)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :
Cindy Thérèse Cornelia CUYPERS : **DEVICE FOR TREATING A**
David Ian STANBRIDGE : **GAS/LIQUID MIXTURE**

International Application :
No. PCT/NL99/00677 :

International Filing Date :
04 November 1999 :

Priority Date Claimed :
04 November 1998 :

Serial No. Not Yet Assigned :

Filed Concurrently Herewith :

Pittsburgh, Pennsylvania
May 3, 2001

LETTER RECOGNIZING ATTORNEYS

BOX PCT
Commissioner for Patents
Washington DC 20231

Sir:

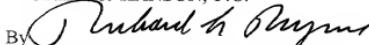
Enclosed are appropriate papers for initiating the national phase of the above-identified PCT application, comprising a specification, claims and drawings. A Preliminary Amendment is also enclosed.

Please accept the application for purposes of granting a filing date and recognize Richard L. Byrne, Russell D. Orkin and Paul M. Reznick, Registration Nos. 28,498, 25,363 and 33,059, respectively, as attorneys in this application, pending the filing of a formal Declaration and Power of Attorney.

Kindly direct all communications relating to this application to **Richard L. Byrne**.

Respectfully submitted,

WEBB ZIESENHEIM LOGSDON
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By 

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